Notebook Series -- Notebooks by Edison
Notebook, N-16-04-01

This notebook was used during April 1916 at Edison's winter home in Fort Myers, Florida. All of the entries are by Edison and pertain to the manufacture of disc records. Included are descriptions of experiments to be performed at the West Orange laboratory and speculation regarding the source of defects in the records being produced, as well as details of the experiments performed in Florida. Many of the experiments planned and recorded in this notebook relate to the coating of disc record blanks with Condensite varnish. Included are notes on the composition and consistency of the experimental varnishes, along with descriptions of annealing tests performed on the records, experiments to stop "creeping" of the varnish, and methods of applying the varnish evenly. Also included are drawings of machinery intended to apply the varnish evenly, a list of resins tested for solubility in alcohol, and the notation that "We use too much 6/4" (hexamethylene tetramine). The notes indicate that Sherwood T. (Sam) Moore assisted Edison. The front cover is labeled "Disc." The pages are unnumbered. Approximately 60 pages have been used.

Fort Myers April 1 1916 —

poured on small discs 8 regular Var containing 100 Resin 155 alcohol with 1% Sandrac as compared to resin content + the regular amount of Negrosin —

Whether thick or thin the plates were even showed no Trace of Wrinkles

In drying there was no Creeping

The Varnish sent down by Hoffman is free of Para or 6/4 —
In using it to get reg varnish to each 265 grams of Var add 1 gram of Para + 7.9 grams of 6/4 This makes it standard Varnish —

Expmt for North –

Use Thermometer on press –

Transfer 1412 low rim req Var
req schedule BUT remove pressure
to 100 lbs when cooling Time comes
+ then Cut off steam When it
reaches 180 remove pressure &
Take out transfers putting in
box till Cold – Then print +
test for Cracks using req way
for another 12 as a check
Want to see if Contraction not
under pressure is an improvement

North Try a number of schedules
1914/-blank loco rim to find the
lowest number of minutes the
final Curing Can be done in
+ have free release, this will
help out print.

Theory = We use too much 6/4 - making Condensate too brittle, after large amount of high temp Curing in press,

If we use less 6/4 there is bad free release, buds + pull outs. It is very desirable that the final record should have a horn cut

To obviate the poor release we can use flat or low rim plates that helps some,

2nd low rim plates smoother perhaps Nickel plated -

3rd Add More Sandrac this may make it more brittle than it does good,

4th Chill down by Ice Box to get free release,

5 = perhaps something decomposable giving gas around 300° will make free release

6 = possible Oil Ben ~~Sam~~ Varnish may do – ditto Sesame if it can be got in Var, it being used in Alcohol —

7 A double layer on plate, 1st layer a very Thin Coat with Reg 6/4 or perhaps higher — Condensed at 170 or less. Over this Power 6/4 Var, to cut horny.

Scheme -

Flow thinest possible Coat Varnish or if uneven lacquer Varnish on. bring up in oven so it just goes rubbery - Remove - break bubbles.

Then flow or lacquer again - Condense + break bubbles

Then finally flow - + fully Condense,

This Scheme gives great flexibility will stop bubbles, gives even plates,

It is possible that it is not necessary to condense Each layer - Try both ways -

Experiment –

Flow 8 small plates req Var bring up just to Rubbery state. then Cool & soak 4 in alcohol & 4 in water to remove 6/4 & Para Etc; Then put back and run req schedule to see if 6/4 is really removed –

Idea

Varnish plates reg Var Equal to say 10 cc Condensed rubber then flow over Shellac Var dry & Transfer or Victor Mix only finer – or use gob of Vic mix & Electron plate & Blank

Spit a saturated Benzol Sol Containing 140° MP Paraffine around edge of 1¼" plate dried it – then flowed with thinned no 6/4 no para Var diluted – it undermin the Paraffine film – Dont think this is practicable

Apl 1 1916 ~

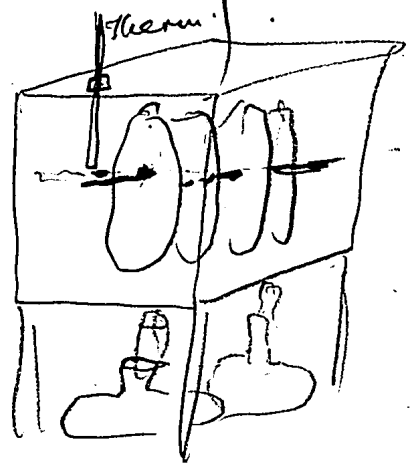
Just tried good Expmt – put 4 of old 3 yr old records which all Crack badly if point of Knife be stuck in around it into a closed Can with Alcohol lamp under & Thermometer under Run air inside up to 180° Fahr & then allowed Cool till 85° Normall temp = by Picking Edges NO Cracks develop by striking Knife point

all over on both sides
not a single crack
developed —
This Experiment shows
our records should
be annealed before
testing + shipping —
After annealing I
tested them + found
slight effects, one or 2
had bad run outs
due to annealing
but the Experiment

was very crude then
bottom of the record
too hot, or ~~wooden~~ air
no circulation –

With rig up to do it better

This was way it was
tried



It is possible we can

Remove the Prints from moulds at 150 @ 180 & put in closed box to cool gradually between papers & render it unnecessary to anneal in a furnace —

April 1 – 16

I notice when I flow the Reg Var no para or 6/4 it dont creep, no wrinkles no waves + frying but when I dilute or little with alcohol it creeps folds + has all the bad properties of uneven plates —

It looks as if low alcohol as we already know is a good thing + I believe we should use quick lime to diminish our water if it will dissolve the 6/4 OK – I believe also rapid Evap of alcohol Condenses water from atmosphere

Possibly our Evaporator or place of Coating room needs Conditioning to have a dry atmosphere

Hoffmans Var without Para or 6/4

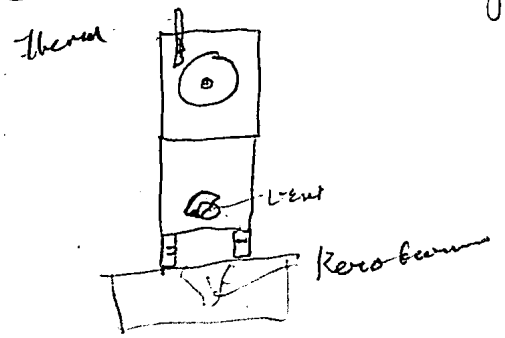
265 grams Var add 1 para or 7.9 grams 6/4 – This Makes Req Var

$\frac{1}{4}$ of this is Varnish 66.2 grms
1.975 6/4
250 mlg Para

$\frac{1}{8}$ is Var 33.1
987 mlg 6/4
125 " Para

Apl 2/16

Annealed Records in high box



Started with 6 Records all tested for surface

Start	1110 am	78°
	1140	84
	1210	106
	1237	124
	1245	130
	1.15	138
	127	140°

Cooled Tested Records (2) for surface, no change - but knife point gave cracks 1/3 of circumference - + opposite sides the one - This temp too low

2nd test, These were in 1st Expt

With 5 Recorders 1 of which Cracked itself - it was one of the 2 I took out to last probably done in handling as I put them together & they rattled on Each other —

Started

At 450 pm	temp	136°
455	"	142
5 pm	"	146
503	"	147½
510		152
520		158
535		165 —

Shut off heat at 165 to cool down — This time had bagging around upper section to slowly cool —

5 surfaces ok - 5 cracked only little ~~[illegible]~~ 1 too Temp too low at 100 unknown

After pouring about 1/2 portion on each plate, a scum formed like land lines from edges near out door surface, 1/2 the area still bright - wife worked a few min at best it does not ~~drop~~ Creep

Think 350 Milg may work with Reg alcohol -

Stearic Acid or Stearine

No good - Scum forms precents drying also Bubbles horrible in Oven

Apl 2/16

Experiments to stop Creeping Reg Var -

Some Amyl alcohol NG
To this added Camphor NG
then more Camphor NG

Made fresh lot Var Reg + to 331 Var added 250 Milg Stearic acid -
This aids the Creeping very much
It all dissolved - the surface of disc on dull in few spots from precipitation of Stearic It wont more -
I will add 250 Milg more Stearic to see if Can get dull surface - This will be 5% Stearic

I find that the Creeping is enormously increased the smaller the amount of Varnish used per plate,

500 Milg is too much Alcohol in Var will not Carry that much Stearic, was frothy a full bubbler added little alcohol & all became clear

Reg Var with only Stearic acid does the same thing — perhaps the Camphor adds a little but not much — Sheets Easily rolled like pie Crust —

The Camphor amyl Al sheets is not sticky in the least Plain Stearic is slightly but probably when dried will be same —

Fine powders could be rolled in this dough —

Made a batch of Varnish with 500 Mlg Stearine, this is more sol than Stearic but had to add a little Extra Alcohol it acts like Stearic + about as good — The tress build over surface just the same but finer = I think 350 mlg to 1/8 portion will be OK

Phenomenon

I added to Reg Var some Amyl Alcohol, then added some Camphor — These addition not working I added a lot of Stearic acid which all didnt dissolve there was pieces left in it. When I poured the Varnish a scum formed over surface probably precipitation of Stearic acid —

As this dried very slowly I put disc on top of Water Jacket oven till it got stiff — temp about 150@160 I scraped Varnish off with knife to a dough it was tenacious + not the least sticky — Rolled it out into a thin sheet + it didnt adhere — it acts like gutta percha Cooled Easily Roll sheets of this + Condense them —

tested the 5 Records for surface —
In 5 faces no change in surface, others had increased considerably — Whereas there was a RO at 1st it increased very much —
The Volume of sound demonstrated only on one Record & This it did on BOTH Sides showing it never was Cured properly
Altogether it looks as if we can Evenly season at say 165 & Cool slowly there will be no Cracks
None Developed on these 10 faces with Knife point —

3rd Annealing Test —

5 Records — previously tested with hand to Ear & recorded — Will run up to 180° Fahr —

Started	10 40 am	84
	10 55	84
	11 am	100
	11 15	116
	11 25	128
	11 33	134
	11 55	140
	12 07	144
	12 40	152
	12 50	150
	1 15	156
	1 32	163
	1 47	166 —
	2 pm.	168
	2 10	170
	2 45	176
	3 10	180 —

Closed up To Cool off —

Note

I previously put 18 Reg Var plates in water bath brought them up to 180° - They condensed I was going to put another flow over them but Fred Ott & my nephew washed them —

I noticed 8/10 of dues had no bubbles — Chem tt be Resin & alcohol, thinning should be made first & allowed a week before use with Pour 4 6/4 —

1st Condensation —

On	12 noon	108
	12 15	118
	12 20	125
	12 37	140
	12 50	146
	1 05	151
	1 15	156
	1 47	159
	2 pm	161
	2 06	162
	2 37	166
	3 08	170

Cooled down out at —

for double pour —

Flowed 18 small plates with Reg solution containing 4% of Oleanic acid — Had to add a little Alcohol. —

I note that when ½ proper amount of Varnish it is lower in Center than Edges — it Tends to run to Edges but dont fry or break like reg —

I fear it is not what we want although they Even up considerably in ½ hour after pouring — not perfectly Even but fairly so — It will depend on the double or last pour.

I poured 2 or 3 heavy —

I notice 50 min after that they are getting Very Even only 3 or 4 not evened up good

Put in OVEN - There were dents but generally they were quite Even — The 2 thick ones had Tree formation on surface —

The results of Schedule on back page nearly Every one full of 001 @ 002 bubbles — But on 2 thin poured no bubbles — on the 2 thick poured, one Mass of bubbles almost a froth or 2 or 3 $\frac{1}{4}$" bubbles —

NOTE This shows that double pours + proper schedule bubbles Even in Very BAD Varnish will be absent =

Creeping Experiments

Reg Var — Drop water on Top NG dont spread —

Var slight dryer + creeping — drop Alcohol Cause an almost bare spot + creeps very much Var recedes from it rapidly

Var poured — Gasolene flowed 001 — This is perfect NOTE dry slow — unevenness film

Var Touched with Gasolene having Oleanic Ac in it — This works fair —

Disc Coated with gasolene Containing Oleanic acid, the flowed — Not good —

Menthol in alcohol drop on flowed plate NG

Chloroform poured on plate then flowed

Ether mixed with Var NG
Very bad -

Chloroform mixed with Var
NG -

Japan wax in Var NG

Stearine 1 gram to 1/8 part
stops creep by forming scum
but all night didnt dry alcohol
out, Then scum is NG →

Paraffining Edges of disc NG
" all over NG

PHENOMENON —

flows Center of Disc 1/2 5/8 dia
+ some irregular Covering

1/2 + 3/4 of area with Var Reg
Let it dry 1 hours, Then
flowed balance of Varnish
after a brief fry which is
rapidly over with draught
reg then building plate
settles perfectly Even

This is probably the best
solution of a single
pour

The best way on big disk
would be to flow 3" about
then spread to 5" with piece
metal + dry 1 hour —
think 10 to 15cc is enough
then flow after 1 hours
dry — If double Coat
flow this way bake to 175
then 2nd flow + dry after

Breaking bubbles -
& give final Reg Schedule
bake -
The only doubt is -
Will the 2nd Coat Varnish
run into the fine beades
broken down wont the
air prevent it ——?
? ? ? ?

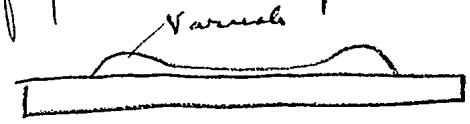
2nd Experiment on Double flow -
No 1 Shelf Reflow of the Coarse
Steamic plates
No 2 Shelf ½ flow of Reg
Varnish -
Make it 5 Hour schedule -
put in at 100 -
Will not try about

4th Experiment

9 plates, with light spot flow dried well than a 1/2 flow on this — after baking to 180, found 2 or 3 bubbles on all fine — only few open on the 9 on 3 large bubbles — Broke all the bubbles open + will spot flow - then the other 1/2 flow + final bake to 200 + then to 235 —

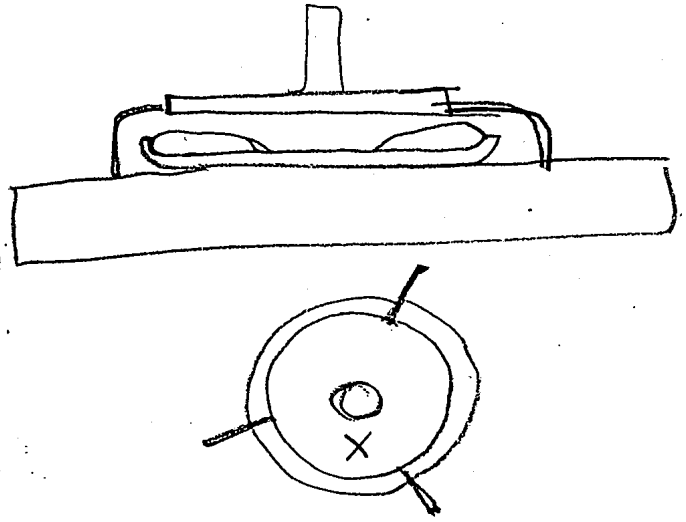
Notes

film even on flat plates always draw towards area of greatest Evaporation



This is true no matter what Varnish used —

When the alcohol has reached a certain stage of Evaporation the film draws flat under good conditions but generally the center gets too thin + it does not flatten perfectly leaving a hole of 1/2 thickness in center



Evaporation only at Edges give a permanent hole in Center

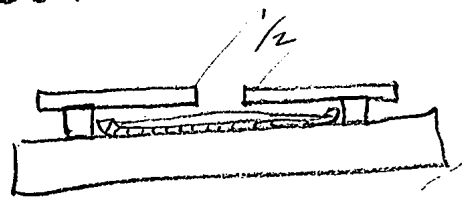
1/8 smaller Dia to X

+ 1/16 from surface of Var

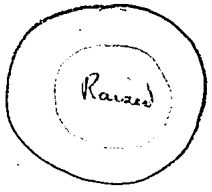
gives low place 5/8 dia

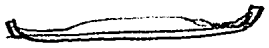
On the other hand

If made thus



This gives a raise in the Center





Raised part about 7/8 dia

1/2 sq in 16/8 – or 7/8 is 49

or 3 times the area

Resins Soluable in Alcohol

Zanzibar Seed – Dissolves Good

Kino – " Some

Kaydaya " Slight

Spruce " Very Good

Amber Congo Copal " Balls, to

Elastic mass – probably some dissolves

Jacamaha Gum – Dissolves good but will have to be filtered – full dirt

Gum Catachu Dissolves Very Little

Aceroides gum Very Soluable

Jutahong powder, dissolves some

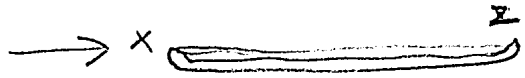
Indian gum – not sol

Light Ester gum Very Very Sol

Gum Euphorbium Doubtful,
Myrrh a Little
Kauri #1 Balls together
Ammoniacum Tears poor
Gum Senegal poor
Guaiac, No considerable must be filtered
Gedda poor
Karuya Doubtful.
Galbanum Mass poor
Locust Tragacanth Quite Sol
Mastic – Balls
Singapore Dammar Doubtful
Aspirat gum "
Batavia Dammar "

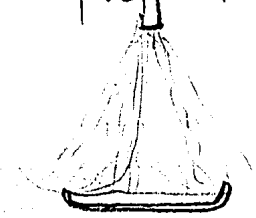
The law is that the varmint thickens the most at the greatest point of Evaporation + will draw it away from point of small Evaporation

With an Open plate the air of which is blown across it in one direction The Varmint will be thick at X + thin at Z



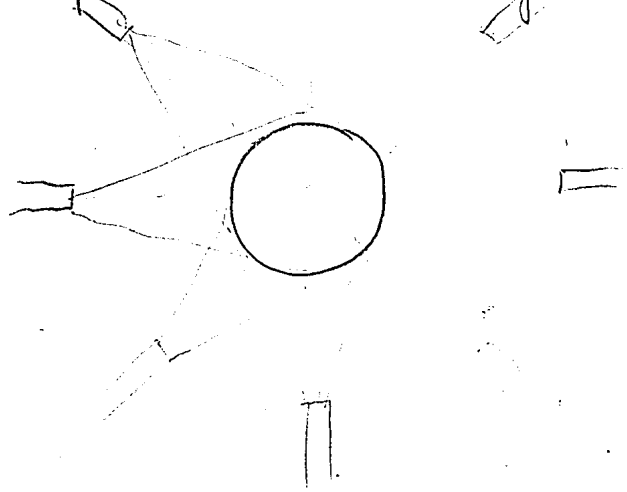
because wind gets more + more saturated with alcohol as it passes across the plate + Evaporation is quicker at Z

The only way to get evap Even is To blow directly down

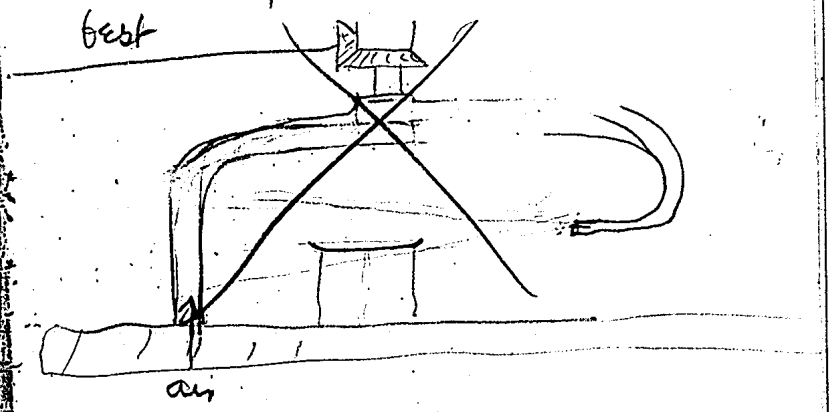


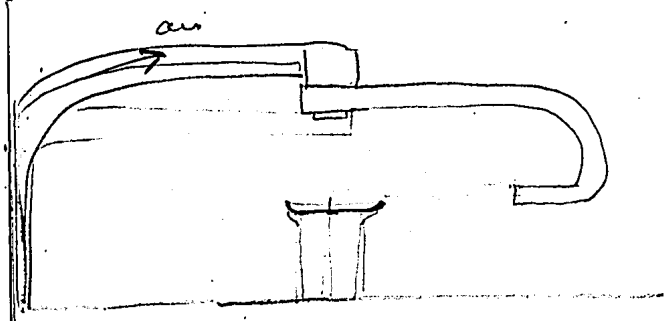
+ Even this will have to be

Experimented with to get it even



A rotating air pipe would be the best





or rotate the plate slowly.

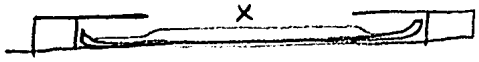
think this would be dangerous

On high humidity days lots of water would be condensed by the rapid Evaporation of the alcohol to prevent this the air must be heated slightly by passing over steam coil —

The experiments with the center hole for prevent shallow centers & to produce an even flowed plate which was a success with the 1 5/8 plate is a failure with a Reg size Varnish plate,

The Varnish creeps to the exact size of the hole

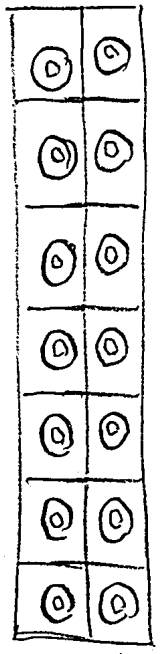
with a hole 7½" dia -.



It took this shape 2½ hours & the outer Edge was extremely thin of Varnish —

While drying the high part X was very mottled & while it evently got smooth it will not be successes

Should we want to insure that Extreme outer rim should not be Thicker than other part all that is necessary is to protect it from rapid evap



4-11-16

Tried to stop cracking of old records by soaking surface with alcohol but it does not prevent cracks when point of knife put in —

I notice that if Strong Sulphuric acid is put in gasolene it browns the acid slightly — If even Formaldehyde is put in a thick condensation produced is enough to get very thick by stirring & the gasolene disappears —

leaving a dark red pulp.
possibly OK for Disc or Lac

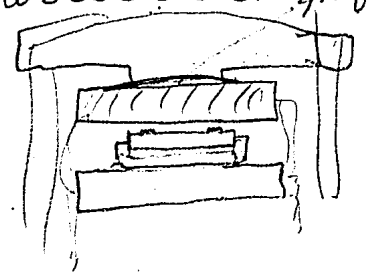
Eventually if Moore found that Red Centers disappeared when new alcohol was used instead of alcohol used in the flowing Room — both in the blank Then Water on Vac dryer dont Come out. The friction increases & the blank dont squash down so the Center of Varnish prints — as the Center is always low —

The remedy is to make an even flow plate by the blowing process —

& Second raise the standard of our alcohol by using highly sensitive blunt liquor —

In the case of making a flat blank

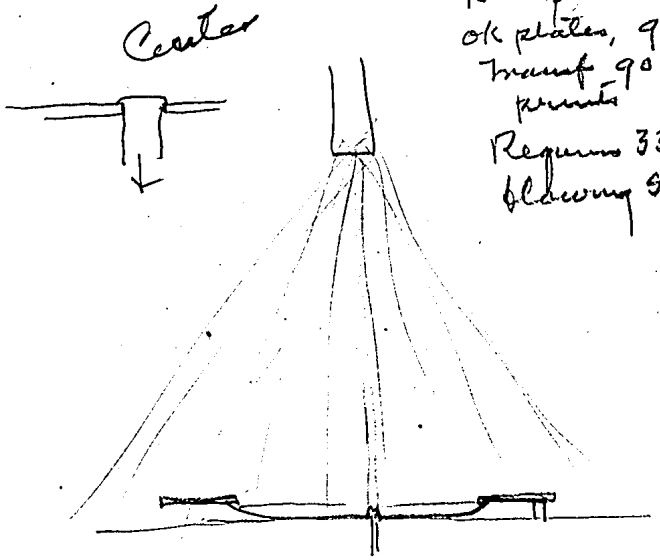
Perhaps 3 spots on steel disk would do it graphite & oil, & polished



Careful Examination of Rubber plunger should be made right along

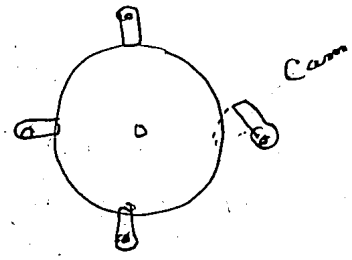
Also the turning off tool & flatten —

Center



40000 plates – 95%
ok plates, 90%
Transf 90%
permits
Requires 333
following stands

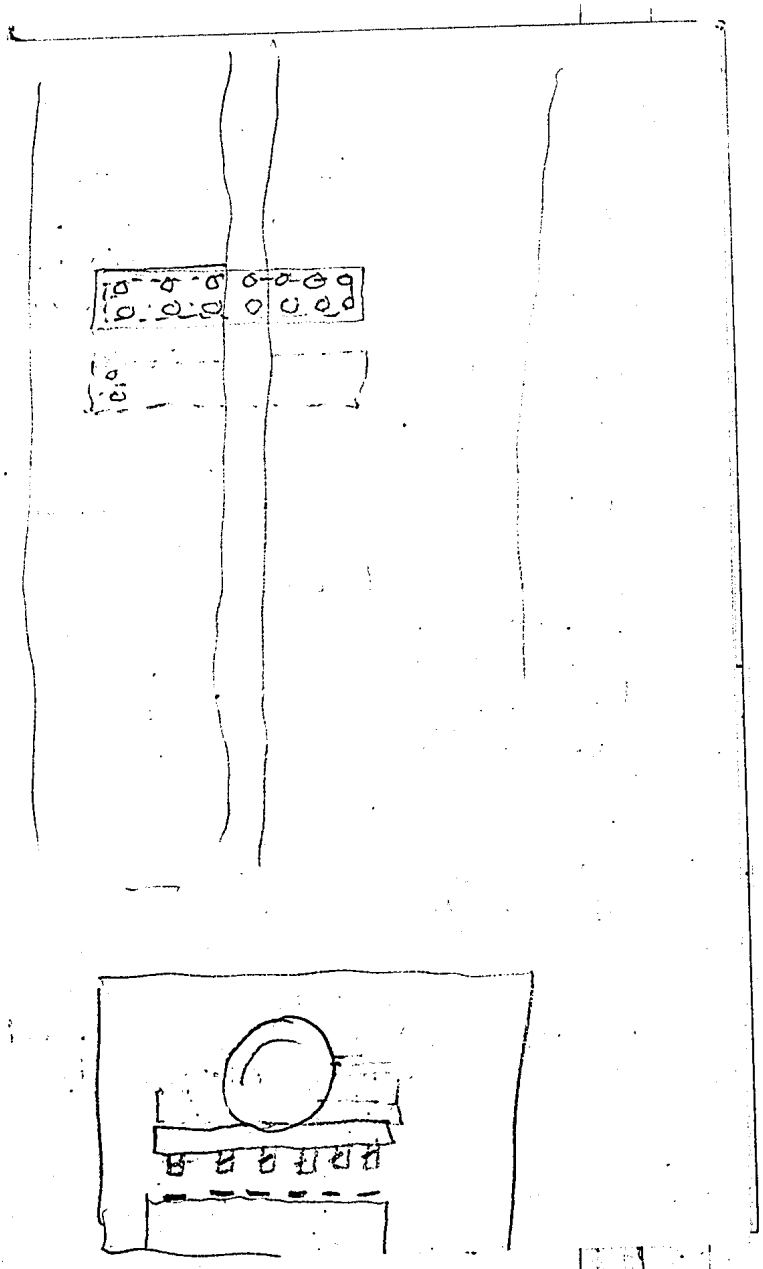
Hold down edges & centers & blow Var till set this will make thickness Even
Even if plate is warped



The phenol has water in it
this dissolves certain salts
it may be blowing warm
air thru pipes of manulite
may eliminate the water
& precipitate the salts
& the phenol follows
this will eliminate the
salts without the
necessity of using acid

If this doesn't work & its
an alkaline combination
with the phenol then
HCl gas might do as this
would not likely to
combine with the
phenol - but the HCl
might attack the
still pipes -

Perhaps passing
more CO_2 thru would
break up combination
& precip the salt,
forming a Bi Carbonate



We can always correct some unevenness of veneer by varying the Shellac in powder + with a blown plate without clamping it flat, more Lac will have to be used than when it is clamped

Also if the fineness of the grinding increases more Shellac must be used as increased fine powder tends to make it dryer + ~~[illegible]~~ blank will be less plastic + not take care of unevenness of the plate veneer —

Also if Alcohol is low proof, more shellac must be used as more water will be left in powder + this acting on Lac makes more friction + less plastic

What makes free release is the decomposition at 125 lbs pressure. 330° Fahr of something in the Varnish this tends to strip the veneer from plate, if this substance is diminished it will tend to diminish the free release —

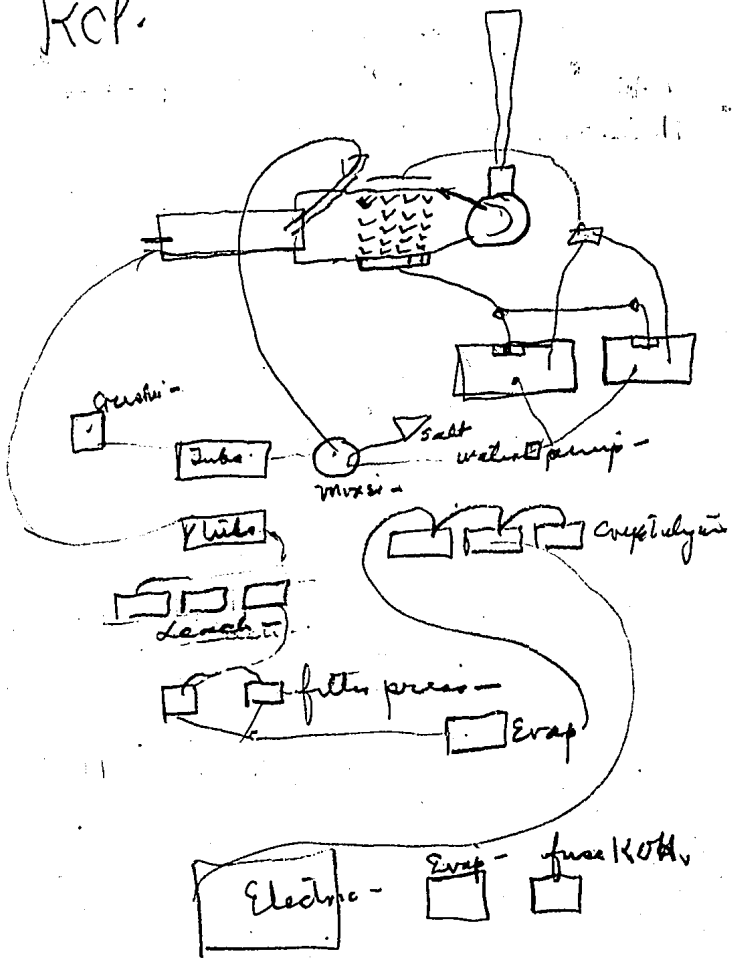
Its probably something in the Dandrac that makes this gas =

Also another thing that makes for free release is a low rim plate, or no rim at all,

Transfers that would stick badly on high rim plates wouldn't stick at all on a flat plate,

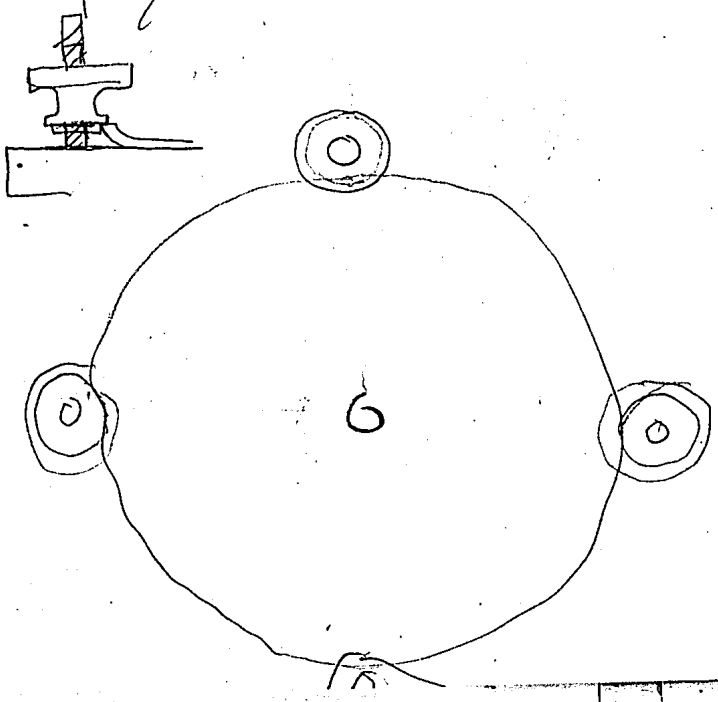
Dents + Buckles must be got out of plates —

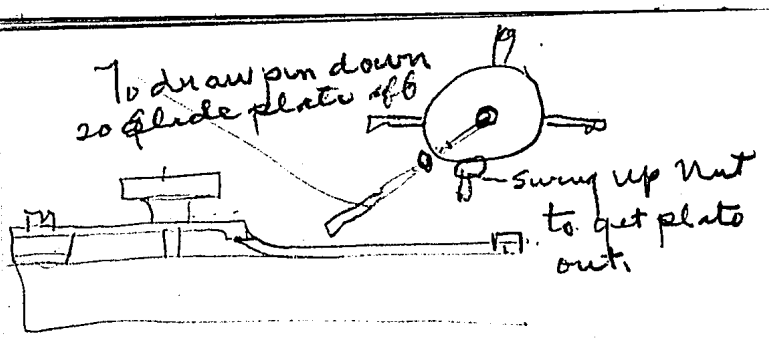
KCl.

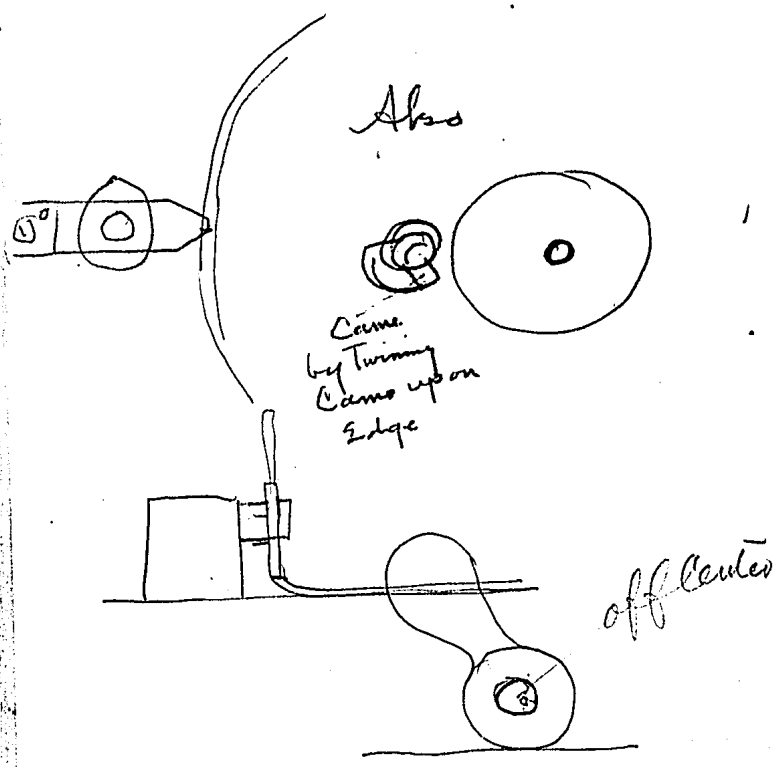


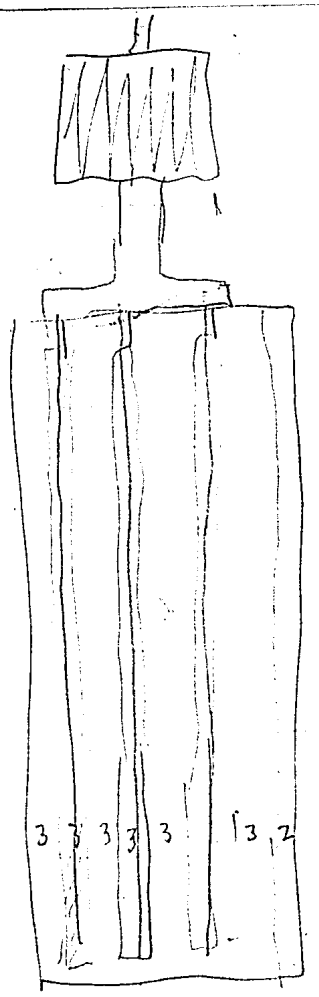
See about plant for 100 lbs daily para cresol phenol —

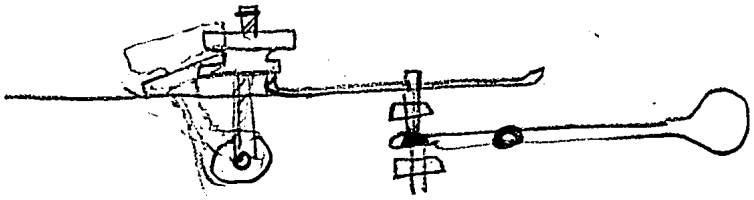
Clamping down plates is essential as they crack up 1/8" some



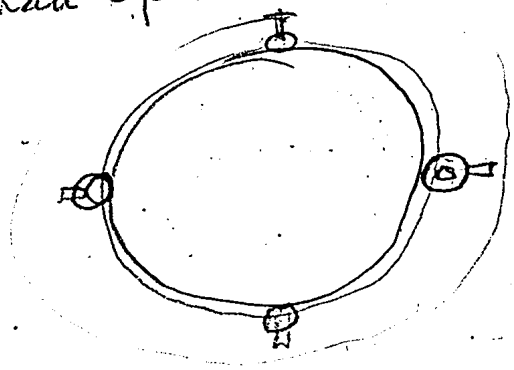

To draw pin down
so Glide plate off
swing up Nut
to get plate
out.


Abs
Cam
by Turning
Cam up on
Edge
off Center

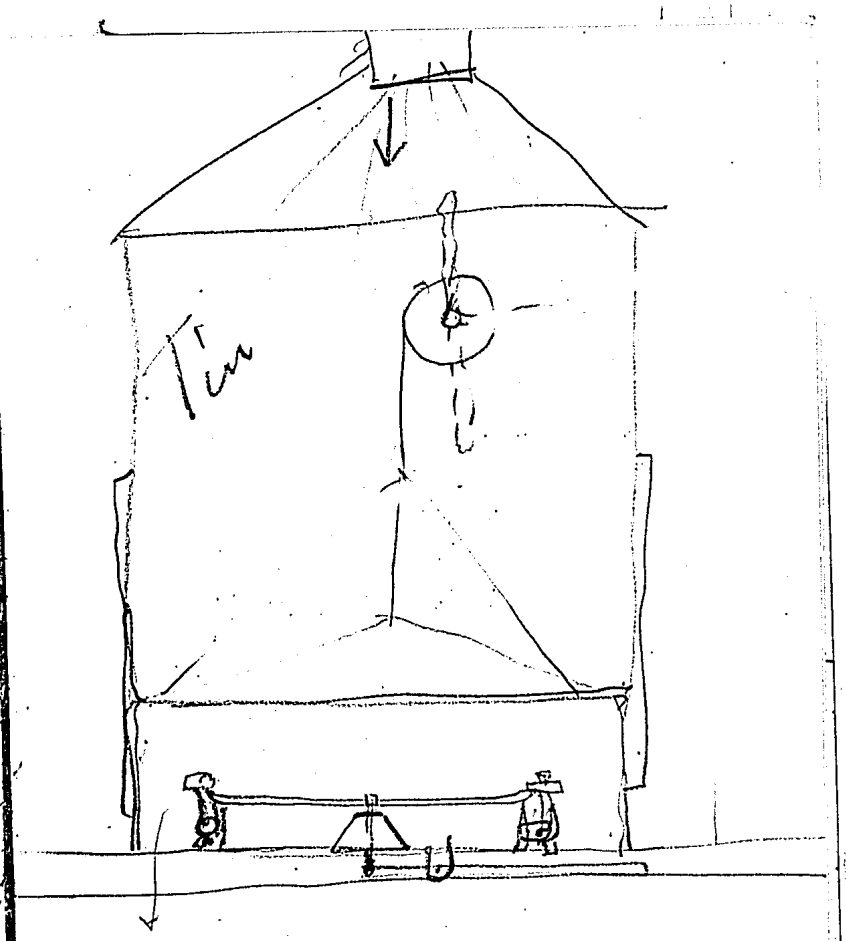

3 3 3 3 3 3 2



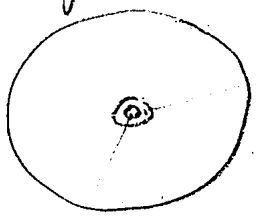
Get a more sensitive level than spirit level —



Use our waste Myrbane acid to make Parnitrophenol —



See that all the bottoms in moulds are thin so they do not take the pressure off centers.
I found on last Campaign 2 too high



Thin

Hole →

Moore said he would have them fixed —

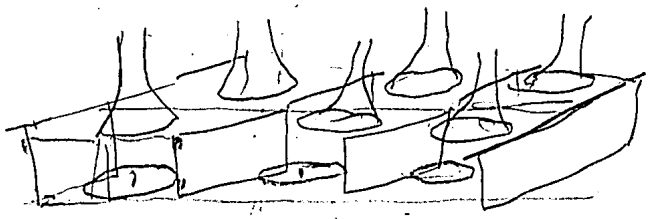
Investigate if they are not now making finer powder hence less flow for same Shellac

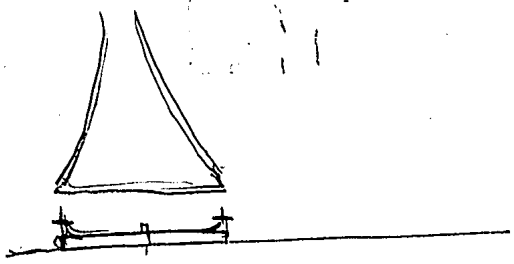
Test all the records now put away for time test —

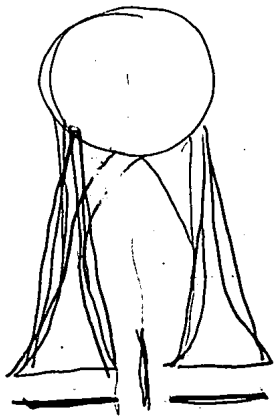
Get 100 Records from Baldwin & make Knife tests —

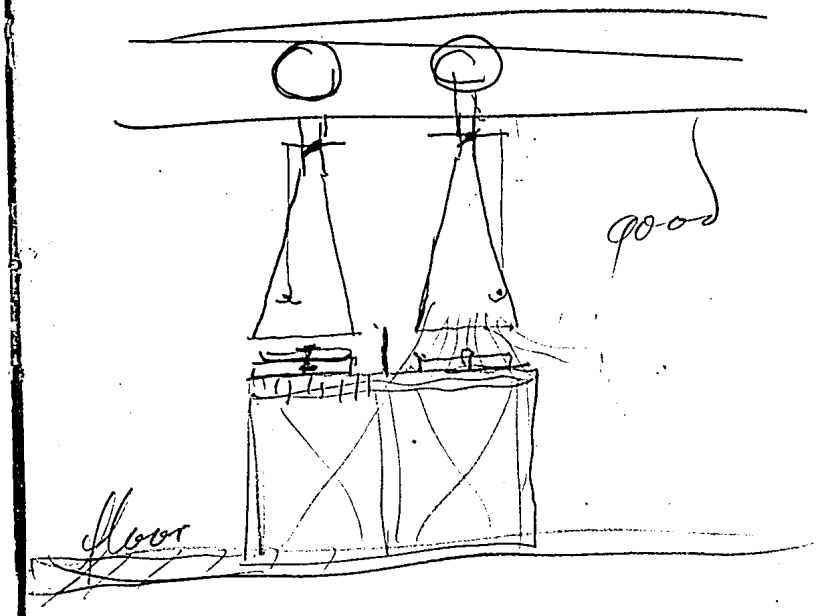
See How plates come out with filter press Varnish —

Tell Moore, Hard Baldwin press feed line Cracks —

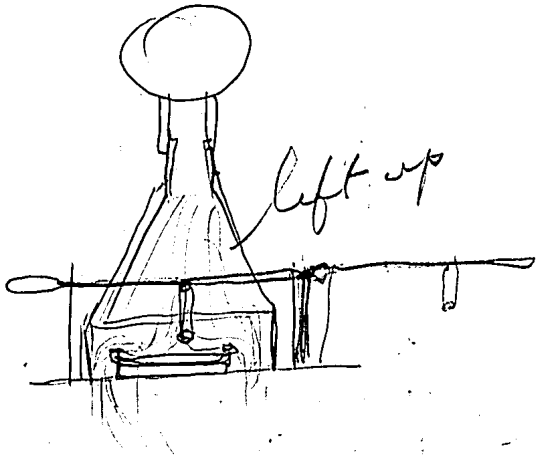


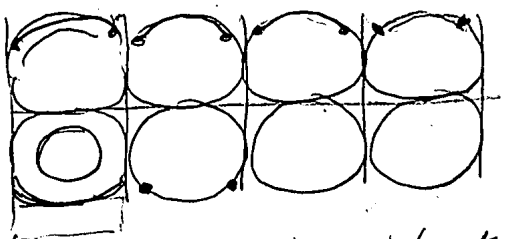




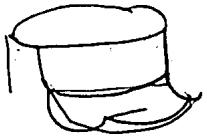

good
Moor

lift

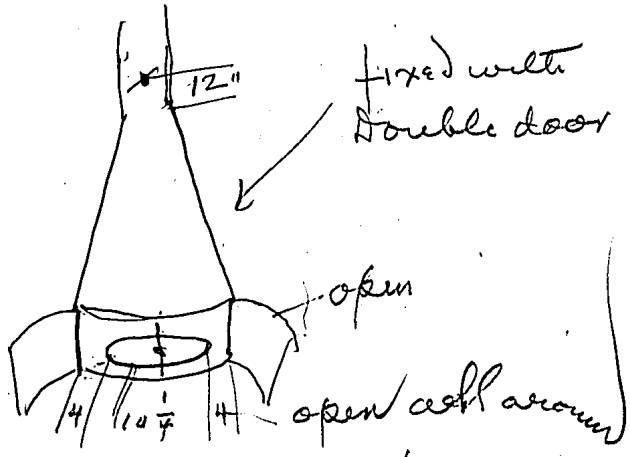


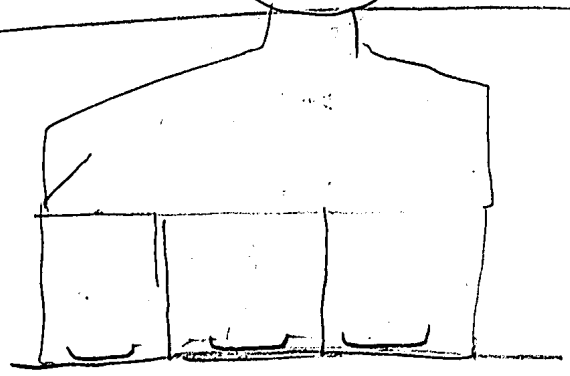


front drops down but if Round



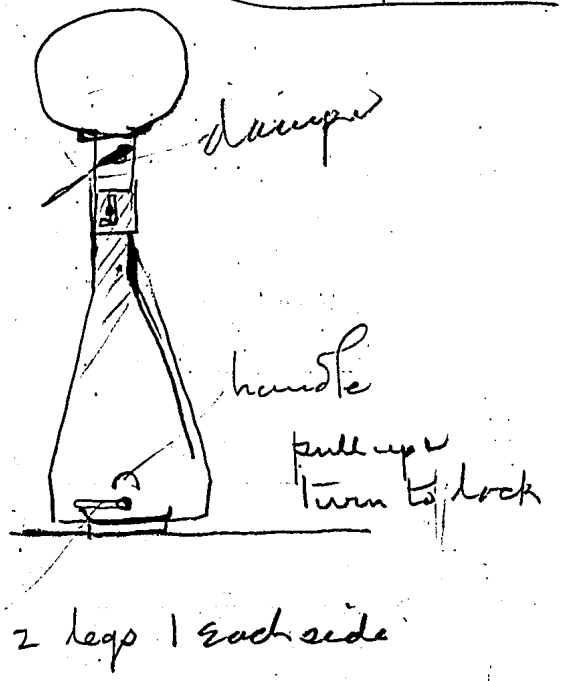
or its split like a Victor Door

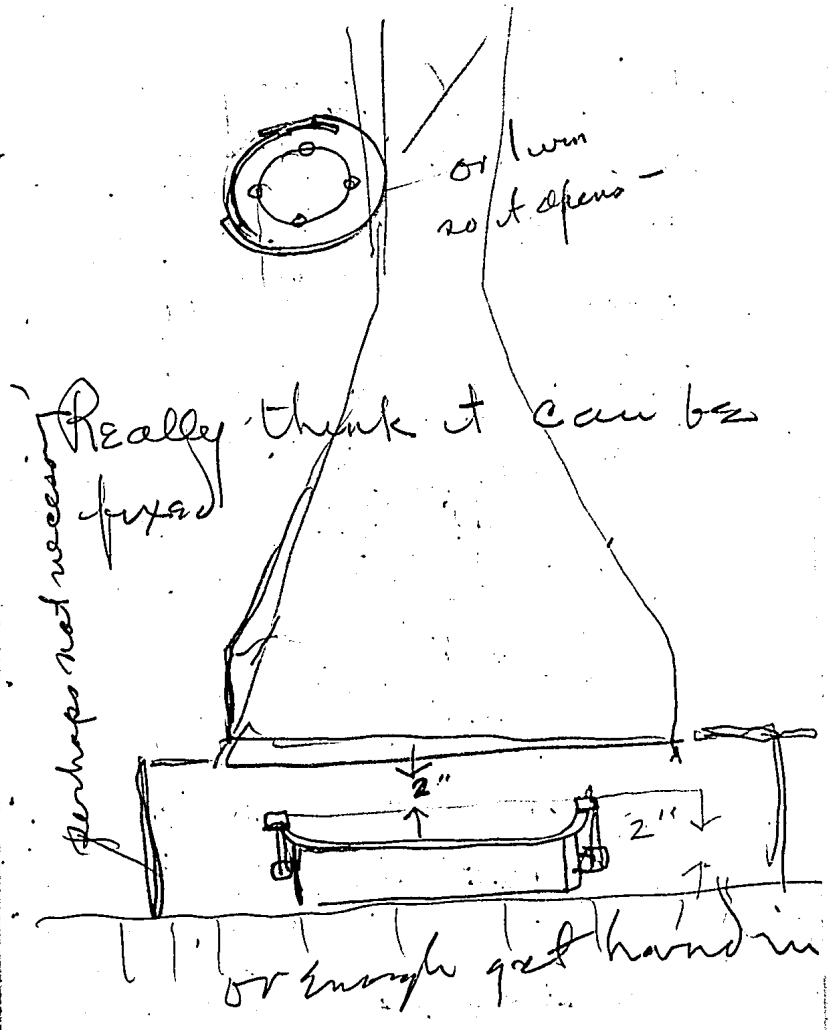




Possibly if we make double flow must use floor 3 1/3rd of it —

Also may have to put filter Chamber heating Coil on 5th floor of Nehr has room or 3rd floor + blow up to 4th as well as 3 floor





Calliper Varnish plates —
See if rounding on plate holder & also on plates are all the same & if they fit —

See if press platens Blank Transfer & print Calliper same thickness all over — They are flat but may not Calliper same thickness —

Condense Aniline then with HCl dissolve out free aniline — then can add phenol — Aniline Cheaper & this process gives definite phenol & known Resin —

Be sure try Expt taking out transfer at highest temp possible to stop cracks say 175 @ 180 if flout puff up —

When plates are blown & even if we then have trouble — go for the ovens, uneven heats & condensation

Try the Double flow Blow-bake then break Bubbles & Reflow & final bake —

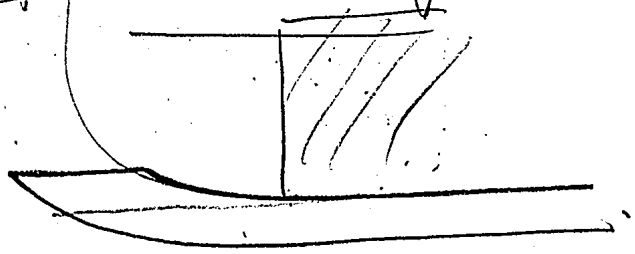
While Expanding & getting ready for blowing full scale try 1¼ 1⅓ etc more back to clap Rad Centers so we can go ahead

See Walter Miller — Galey-Cronkite, & his Recording Man Shad last 15 Rejected records & use Kathleen M & fix it once for all & say think he better go back to old formula Etc —

See about Thermometers
see if correct by using
old ones —

Stop using new alcohol
in 1412 blank

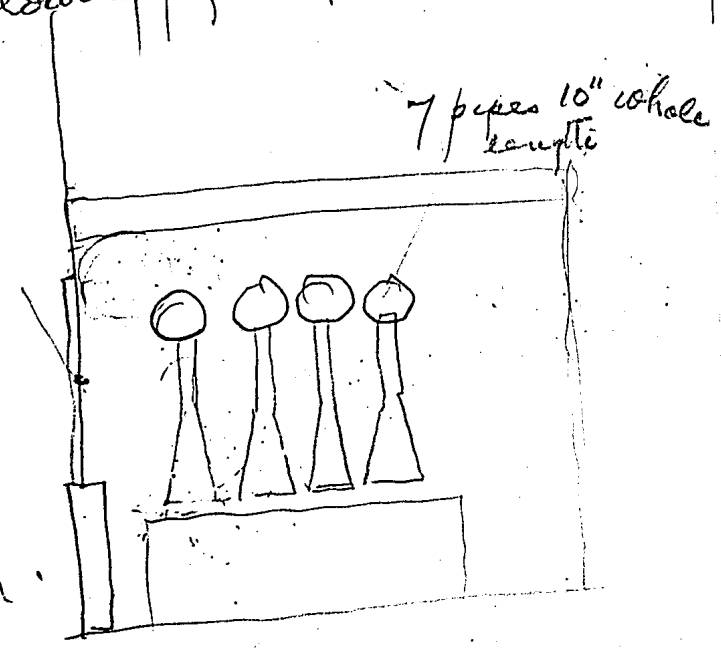
+ make dup Experiment
Exactly as I made
to see what changes
take out at 125
~~Burnt + Transfer~~ —



See if any part of Edge of
blank is on the Curve
if so think we should
Edge them small so this
Cant occur, on the other

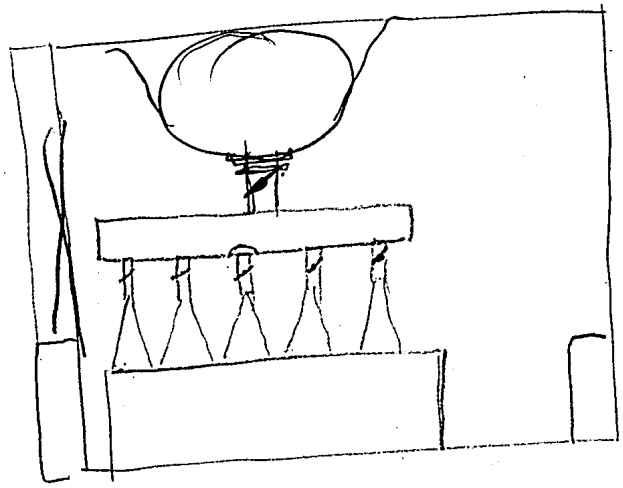
hand it may be an advantage
like the padded up Record mould

perhaps the easiest way to put
blowing pipes up is thus

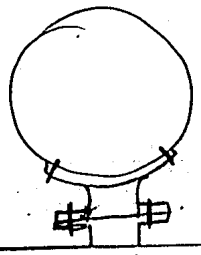


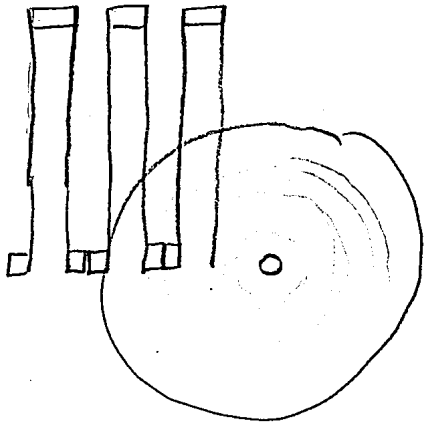
or

perhaps Spiral weld Pipe
people have pipe in stock
& also fittings in stock

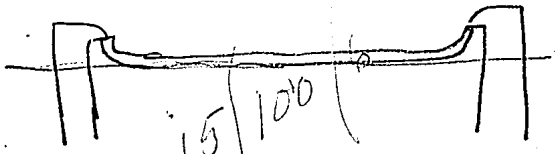


Can make casting for
fitting Thus





1 25 (1000 (8
1000



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